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Four new psaphodesmine genera from the Papuan Region (Polydesmida: Platyrhacidae)

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ABSTRACT

The new platyrhacid genera *Acerhacus* (type species: *A. oxylomus*, n. sp.) and *Clastrorhacus* (type species: *Platyrhacus acmophorus* Chamberlin), are described from New Guinea; *Betarhacus* (type species: *Platyrrhacus fallens* Chamberlin) from the Solomon Islands, and *Corymborhacus* (type species: *C. manus*, n. sp.) from the Bismarck Islands.

Ongoing investigation of the platyrhacid fauna of Indonesia has disclosed both undescribed species as well as a number of named forms which are no longer referable to *Platyrhacus*, the genus in which they were described. Some of these orphaned species are accommodated in the new genera proposed here as part of a continuing survey of the tribe Psaphodesmini, initiated with my recent (1997) account of *Parazodesmus*. Several larger genera such as *Ozorhacus* will be discussed in individual accounts as the opportunities arise.

TRIBE PSAPHODESMINI

Psaphodesmini (as subfamily) Cook, 1896, Brandtia, p. 4. Hoffman, 1980, Classification of the Diplopoda, p. 163 (as tribe).

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Because of the apparently random loss or gain of apical gonopod processes, it is not possible for me to identify any single apomorphic condition that defines this taxon, nor phrase a definition that is not extensively qualified to account for exceptional conditions. Yet the genera (species groups) appear to be both internally cohesive and related by characters shared in a variety of combinations. Possibly, greater precision will result from knowledge of the numerous psaphodesmine types remaining to be discovered throughout Indonesia. Members of the tribe abound in all of the islands from Sulawesi to Guadalcanal without, at least with present information, much correlation of gonopod diversification with geography.

In addition to the four proposed herein, the following genera are referable to the Psaphodesmini:

Psaphodesmus Cook, 1896
Zodesmus Cook, 1896
Parazodesmus Pocock, 1898
Pleorhacus Attems, 1914
Ozorhacus Attems, 1933
Erythrhacus Hoffman, 1962
Petalorhacus Hoffman, 1997

Corymborhacus, new genus

TYPE SPECIES: *C. manus*, new species.

NAME: A neologism composed of the Greek elements *korymbos* (group,cluster) and *rhacus* (from the generic name *Platyrhacus*), in reference to the crowded basal placement of the five apical telopodite processes.

DIAGNOSIS: Gonotelopodite with five distal elements, the formula **a,b,c.D,E**; **D** and **E** nearly syntopic, generally similar in size and shape, notably divergent: processes **a, b**, and **c** distinct and separate, not borne at the end of a common basal stem and much shorter than processes **D** and **E**. Coxal setae moderate in size, slightly penicillate apically.

REMARKS: *Corymborhacus* shares the full compliment of five apical processes with only two other genera: *Psaphodesmus* and *Parazodesmus*. In both of these taxa, processes **a**, **b**, and **c** are located distally on a long slender stem, and the gonocoxa is provided with a dorsal field of long, robust, apically penicillate setae. Process **e** is greatly reduced in *Psaphodesmus*, and the entire femoral region of the telopodite is very slender and sinuous in *Parazodesmus*. The absence of a long common stalk carrying the three distal processes is possibly a more generalized condition, although the isolated, peripheral location of the type species might imply a recent derivative state.

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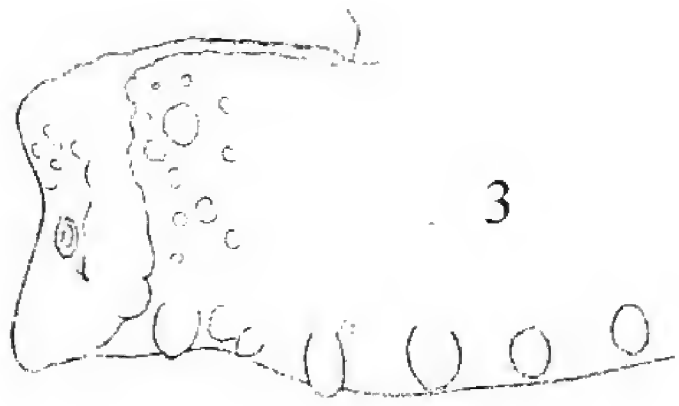
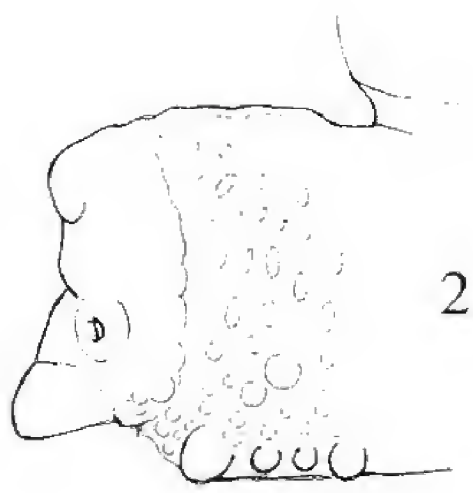
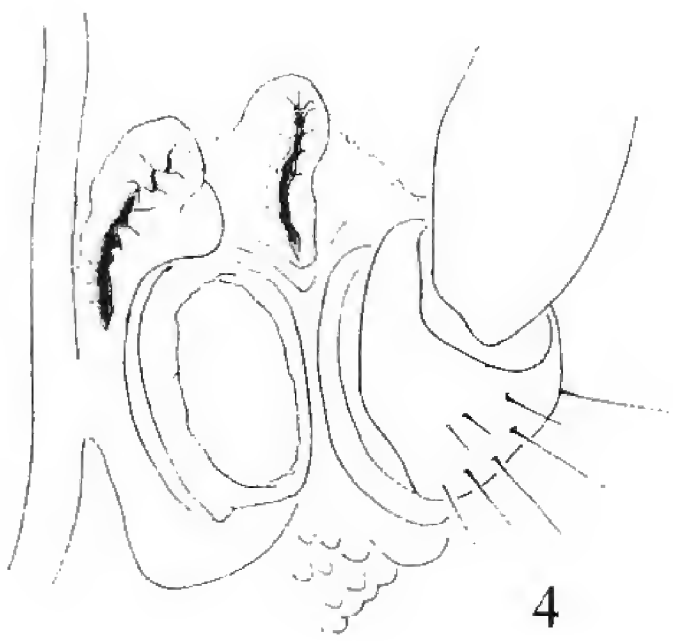
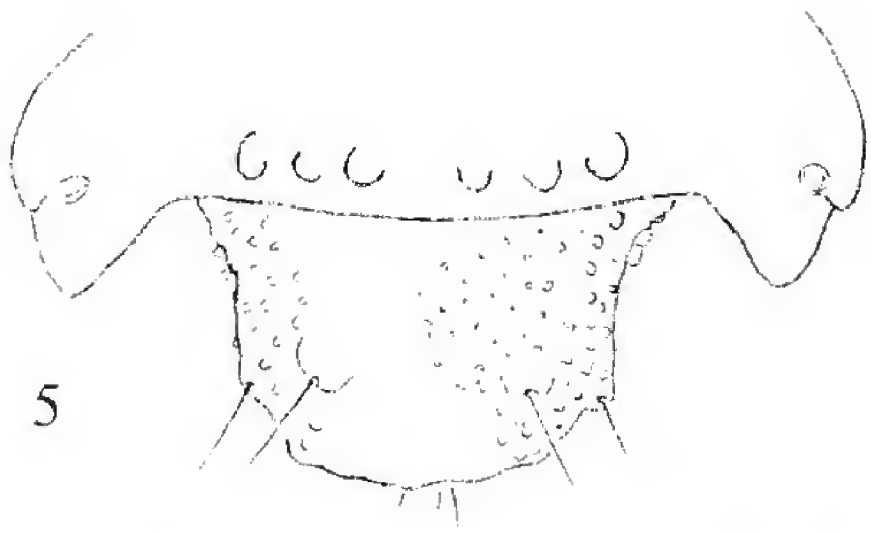
The possibility that this species may have been introduced on Manus from somewhere in New Guinea must be taken into account.









Figs. 1-5. *Corymborhacus manus*, new species. 1. Left side of collum, dorsal aspect. 2. Left side of metatergum 9, dorsal aspect. 3. Left side of metatergum 13, dorsal aspect. 4. Coxal sockets and stigmata of midbody segment, oblique ventro-lateral aspect. 5. Segments 19 and 20, dorsal aspect. All drawings from holotype.

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Corymborhacus manus, new species
Figures 1-8

NAME: The name of the island on which the species occurs, considered a masculine noun in apposition, and also in allusion to the Latin word *manus*, as the gonopod as seen in mesal aspect fancifully resembles a hand with five dissimilar fingers, bent at the wrist at a right angle.

MATERIAL: Male holotype (ZMC) from: PAPUA NEW GUINEA: Manus Island {Admiralty Islands}: Lorengau: 22 June 1962, "Noona Dan" Expedition.

HOLOTYPE: Fragmented, approximate length 34 mm, width of collum 3.8 mm, of segment 2, 5.5, of segment 4, 6.2, of segments 5-14 ca. 6.5 mm; W/L ratio at midbody about 19%. Color of now-faded specimen uniformly light reddish-brown, with legs, antennae, paranotal peritremata, and larger dorsal tubercles yellowish.

Head width 3.5 mm at genal apices, surface finely granulate, epicranial suture obscure; lower half of genae plane, dorsal half convex; interantennal space broad (1.2 mm), one-third head width, and about equal to length of 1st and 2nd antennomeres combined; antennae short and stout, reaching back to middle of 2nd paranota, each article except 1st and 6th only slightly longer than broad.

Collum small, only slightly broader than head, lateral ends present only as small lobes with smooth surface; disk almost smooth, tubercles present chiefly as a series of 7-7 on posterior margin, the outermost three on each side by far larger than the more median (Fig. 1)

Paranota of subsequent body segments abruptly wider than collum, those of segments 2-5 declivent, thereafter becoming nearly horizontal and imparting a distinctly "flat-backed" aspect; metaterga set with numerous flat tubercles of vary-ing size, more prominent on paranota, only a row of 4-4 enlarged tubercles along caudal margin, the outermost two on each side by far the largest (Figs. 2, 3). Anterior and posterior edges of paranota nearly smooth, lateral edge straight on anterior segments, posterior to 5th becoming indented at midlength; ozopores large and distinct, located at base of posterior paranotal lobe nearly in contact with indentation. Posteriormost segments with traces of anterior and median series of enlarged tubercles. Outline of epiproct (Fig. 5). Paraprocts nearly flat, with notably enlarged basal "condylar lobe" overlapping lateral end of hypoproct; latter broadly trapezoidal, the basal edge convex, not overlapping on preceding segment. Podosterna broad (ca. 1.7 mm at midbody), flat, scarcely elevated, without subcoxal spines, glabrous. Sides of metazona granular, without enlarged tubercles. Stigmata with large, elevated and crenulated rims, both pairs of near equal size (Fig. 4). Legs short, stout, the femora in particular subincrassate.

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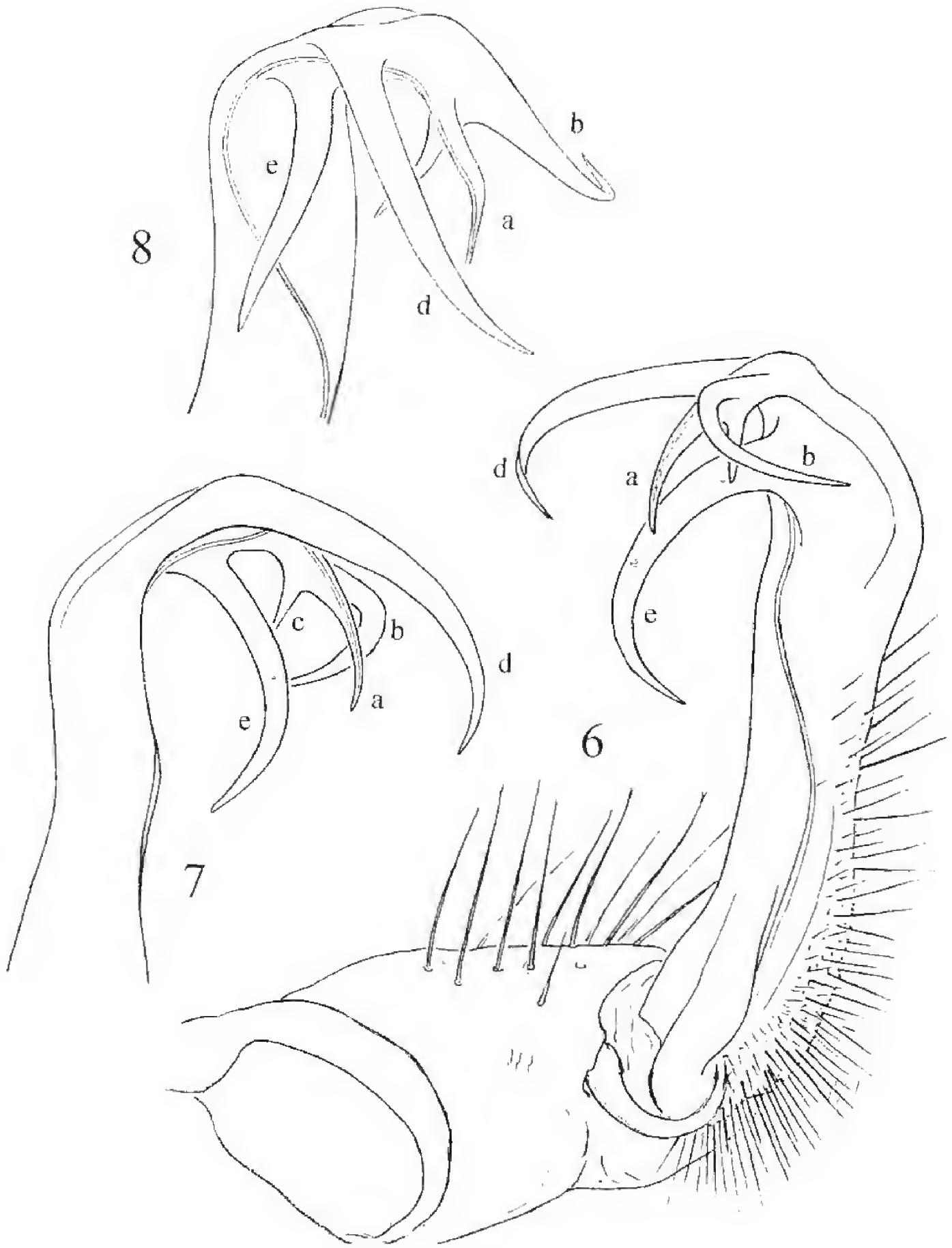
Gonopod aperture moderate in size, transversely oval, the posterior and especially lateral ends elevated as a high thin rim. Gonopods (Figs. 6-8) as described in the generic heading, and illustrated below.



Figs. 6-8. *Corymborhacus manus*, new species. 6. Left gonopod, mesal aspect. Fig. 7. Telopodite of left gonopod, lateral aspect. Fig. 8. Telopodite of left gonopod, dorsal aspect.

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Acerhacus, new genus

TYPE SPECIES: *A. oxylomus*, n. sp. The genus also includes *Platyrhacus pergranulosus* Silvestri, 1895, from Moroka, New Guinea.

DIAGNOSIS: Apical process formula of gonotelopodite **(a, c) E**: process **E** elongated, extended dorsad in parallel with the distal region, latter abruptly bent dorsad, terminating in only two processes **a** and **c**, the former sinuate at its base. Gonocoxae with large, apically penicillate setae

NAME: A neologism composed of the prefix derived from the three gonopod processes **a, c,** and **e**, + the Greek stem *-rhacus*, commonly used in generic names in this family.

REMARKS: At first glance, it might appear that *Platyrhacus papuanus* Attems (1914) is referable to this genus, but re-examination of the type material revealed that the subterminal gonopod process shown on Attems' figure 60 is in fact **d**..

Acerhacus oxylomus, new species

Figures 9-14

MATERIAL: Male holotype (Naturhist.Mus.Wien) from PAPUA NEW GUINEA: *Morobe District*: between Aseki and Haintiba (ca. 70 km west of Wau), 27 Sept 1972, leg.? (J. Eiselt don.).

HOLOTYPE: Adult male, length ca 45 mm (specimen fragmented), widths of selected segments as follows: collum, 5.5 mm; 2nd, 7.7 mm, 4th, 8.3, 6th-12th, 8.5 mm, 16th, 8.1 mm, 18th, 6.5 mm.

Present color (faded in alcohol) light brown (originally maroon?) dorsally, lateral third of paranota and metatergal tubercles clear yellow, anterior and posterior margins of paranota white; legs, antennae, and ventral surfaces yellowish brown.

Head unmodified; epicranium finely granulate, with deep median groove; face smooth, genal depressions prominent, labroclypeal offset distinct; 4-4 clypeal setae, 6-6 labral setae (both series with compound setae). Antennae short, stout; interantennal space equal to length of 2nd antennomere (0.9 mm).

Collum (Fig. 9): dorsal surface finely granular, nearly flat, with anteromedian depression; a prominent row of 6-6 enlarged, flattened, coalesced tubercles behind anterior margin; paranota set abruptly lower and slightly declivous, the lateral apices smooth and polished; a transverse series of 5-5 enlarged tubercles preceding posterior edge and several similar but smaller tubercles dispersed over median discal area.

Metaterga moderately convex, surface coriarious with three transverse rows of tubercles, 4-4 in each, those of rows 1 and 2 smaller, subequal in size, typically round; those of row 3 much larger, more oval, except on posteriormost segments

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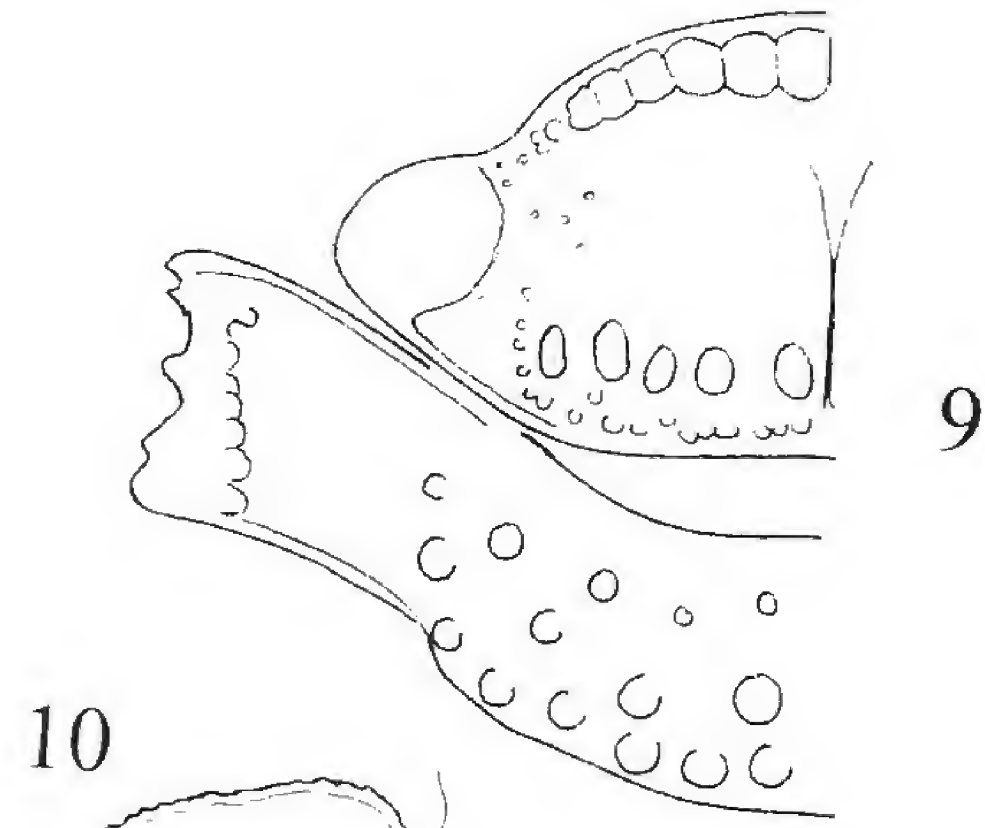

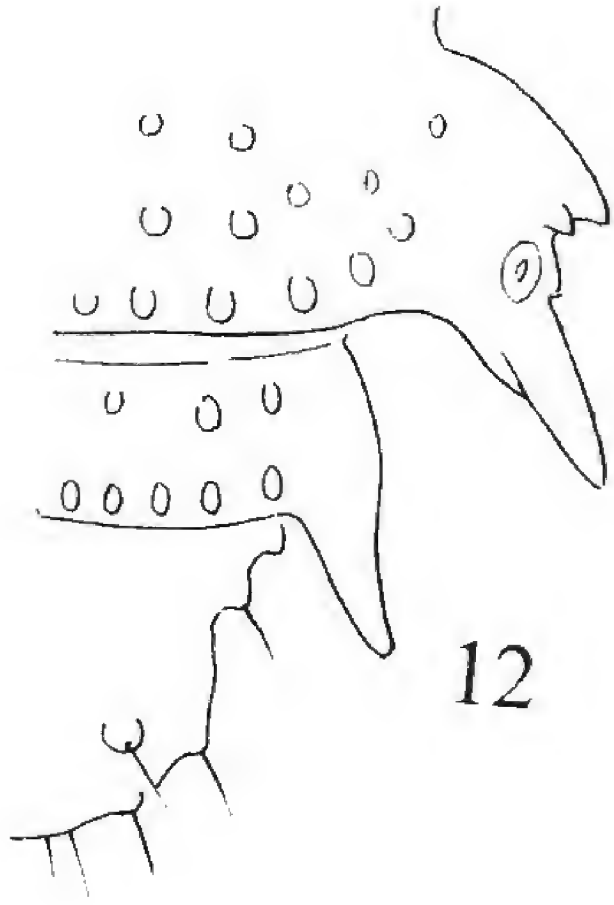

Figs. 9-12. *Acerhacus oxylomus*, new species. 9. Left side of collum and segment 2, dorsal aspect. 10. Left paranotum of segment 9, dorsal aspect. 11. Left paranotum of segment 12, dorsal aspect. 12. Right side of epiproct and segments 18 and 19, dorsal aspect.

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where all tubercles are subequal in size and shape. Paranota large, set high on sides, only slightly declivous, typically incised into two major lobes, the anterior smaller and becoming more so posteriad (Figs. 10 and 11); surface finely granular except the smooth and thickened lateral margins: ozopores large, set near midlength at base of posterior lobe, nearly in contact with lateral edge; posterior edge finely crenulate, narrowly margined.

Posterior segments as in Fig. 12; paranota of segment 19 spiniform, essentially lacking anterior lobe; epiproct broad, apically rounded, not constricted at base. Paraprocts and hypoproct of form typical for family. Legs attached to low, broad, podosterna (width 1.6 mm at midbody) without trace of subcoxal spination. Legs long and slender, apex of femora visible beyond paranota in dorsal aspect, podomeres slender and sparsely set with short stout glandular setae. Stigmata unusually large, the rims elevated, similar in size and shape (vertically elongated slits) except anterior more sigmoid and extended ventrad in front of anterior dorsal condyle.

Gonopods (Figs. 13, 14) as described for the genus, specific characters in the presence of a rudimentary prefemoral process, the relatively short and acuminate process **e**, and the sigmoid curvature of the solenomere (**a**).

Acerhacus pergranulosus (Silvestri), new combination
Figure 15

Platyrhacus pergranulosus Silvestri, 1895, Ann. Mus. Civ. Stor. Natur. Genova, v. 34, p.639. Male holotype (Mus. Hist. Nat. Genova) from "Moroka", New Guinea.

MATERIAL: The male holotype, which I studied in 1975, and illustrated the left gonopod..

DESCRIPTION (translation of the original Latin text): "Brownish-red, corners of the paranota becoming yellowish. Antennae short. Collum subsemicircular, as wide as the head, anterior corners strongly produced, entire dorsum ornamented with numerous small granules as well as three rows of large tubercles. Apex of last segment broadly rounded. Paranota ("carinis") of remaining segments horizontal, anterior and posterior corners nearly square, strongly produced around a large incision. Legs invested below with clavate hairs. Male gonopods ending in two processes, the outer of which is apically bipartite.

"Length of body, 42 mm, width 8 mm.

REMARKS: This species is generally very similar to *oxylomus*, but quite distinct in terms of gonopod structure: a much larger and longer process **E**, and shorter **a** with basal lobe (Fig. 15).

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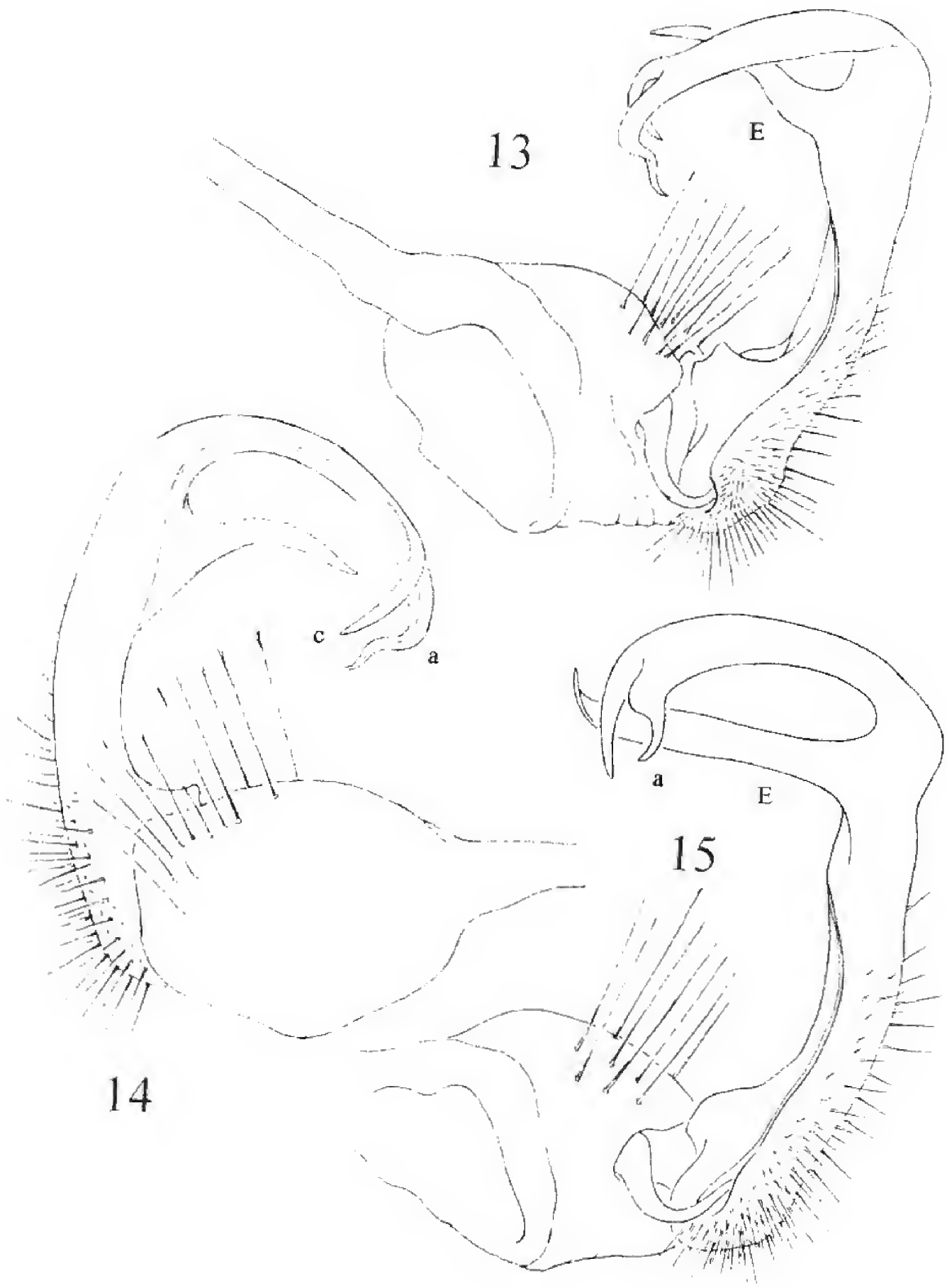

Figs. 13-14. *Acerhacus oxylomus*, new species. 13. Left gonopod, mesal aspect. Fig. 14. Left gonopod, dorsolateral aspect. Fig. 15. *Acerhacus pergranulosus* (Silvestri), left gonopod, mesal aspect. Drawings from holotype specimens.

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Clastrorhacus, new genus

TYPE SPECIES: *Platyrhacus acmophorus* Chamberlin, 1945.

NAME: A neologism composed of the two elements *klasterion* (Gk, a pruning knife) + "-rhacus", a common combining form in this family derived from the generic name *Platyrhacus*. The name refers to the shape of process **c** of the telopodite.

DIAGNOSIS: Gonotelopodite process formula **a, C**; **C** enlarged, falcate, directed dorsomesad, distally recurved. Process **a** relatively short, slightly sinuous proximad. Coxal setae numerous, large, long, distally penicillate.

SPECIES: Only the type species is referable to this genus.

REMARKS: Identification of the larger distal process as **C** is a little provisional, but selected because of its location considerably distad of where one would expect **e** to occur. Whatever the true homology happens to be, the configuration is unique within the Psaphodesmini and merits generic level recognition.

Complete suppression of **C** and corresponding elongation of **a** would produce a gonopod resembling that occurring in the Phillippine genus *Ilodesmus*.

Clastrorhacus acmophorus (Chamberlin), new combination

Figs.16-19

Platyrhacus acmophorus Chamberlin, 1945, American Mus. Nov., 1282: 16, figs. 69-71. Male holotype and 10 topoparatypes (AMNH) from Doormanpad, "New Guinea" [now in Irian Jaya, Indonesia].

MATERIAL: Male and female paratype (VMNH).

MALE: Specimen broken, length approximately 50 mm. Width of collum, 4.5 mm, 2nd segment, 8.1 mm; 4th, 9.2mm; 6th, 9.7mm; 10th, 9.8 mm; 14th, 9.6mm; 16th, 7.4 mm; 18th, 7.0mm. L/W ratio near 20%. Original color lost from long preservation, but apparently dark brown or black dorsally, with paranota, tergal tubercles, legs, and antennae yellow.

Head and antennae of typical formation; front of head microgranulate, labrum glabrous; genal groove very shallow; epicranial groove deeply impressed between antennae.

Metaterga glabrous, smooth and polished, no trace of areation or transverse sulcus, with three transverse series of rounded tubercles, largest on anterior segments, gradually reduced posteriad, first series more distant from 2nd and 3rd, number of tubercles varying randomly from 3-3 to 5-5 on different segments. Paranota set high on sides, nearly horizontal, very deeply incised (Figs. 16-17), ozopores placed near end of incisions; anterior and posterior edges ornamented with

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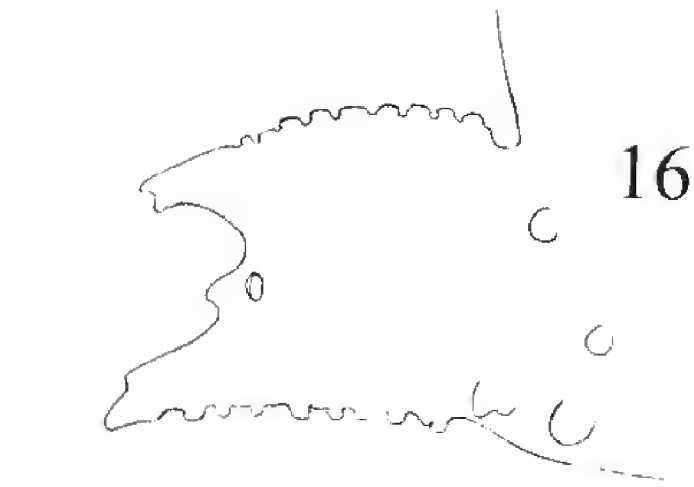

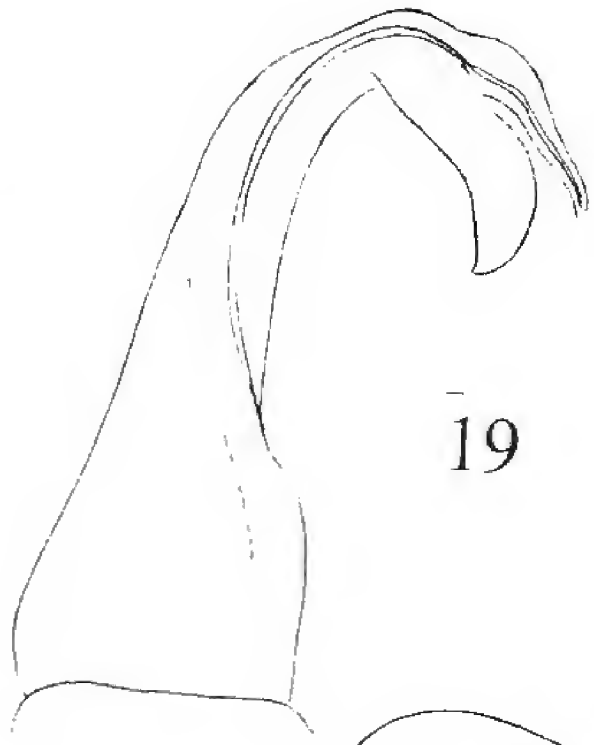

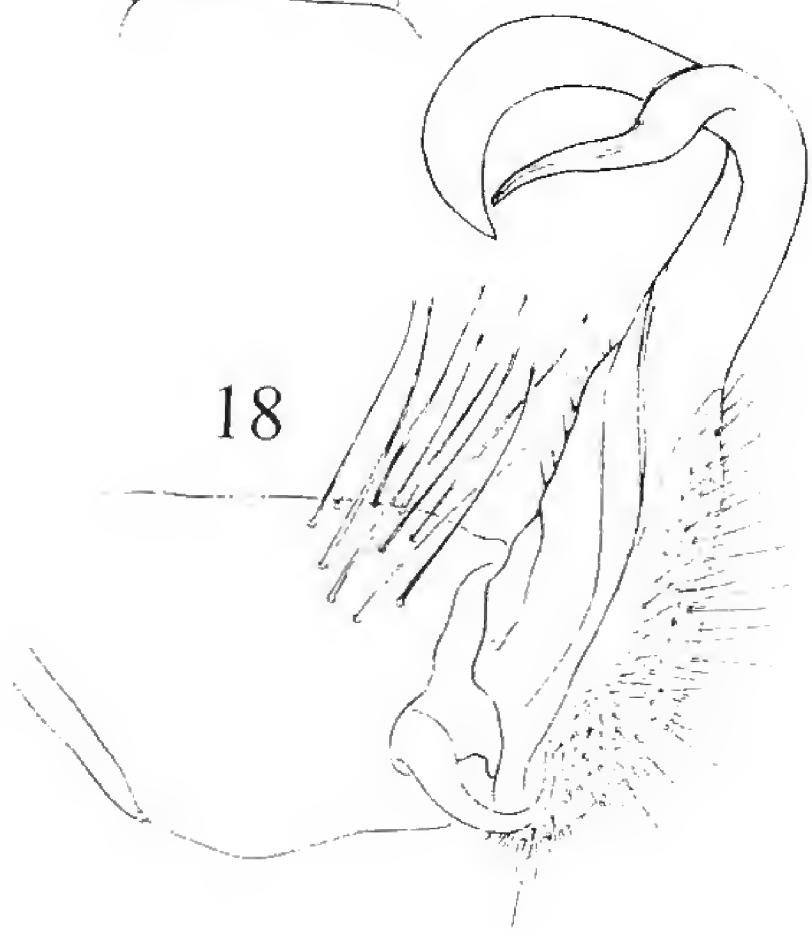

Figs. 16-19. *Clastrorhacus acmophorus* (Chamberlin). Fig. 16. Left paranotum of segment 9. dorsal aspect. Fig. 17. Left side of paranota 18 and 19 and epiproct. dorsal aspect. Fig. 18. Left gonopod. mesal aspect. Fig. 19. Telopodite of left gonopod. dorsolateral aspect. Drawings from paratype.

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a single row of close-set rounded tubercles, creating a somewhat crenulated appearance. Posterior end of body of typical platyrhacid form (Fig. 17). Sides of metaterga with sparse, dispersed rounded tubercles, no marginal series, only a few enlarged tubercles above base of posterior legs.

Sterna of anterior legs narrow and deeply bicruciately impressed, coxae separated by a distance less than a coxal length, very small subcoxal cones present back to first legs of 8th segment, thereafter sterna somewhat broader, strongly elevated, glabrous, about as wide as length of prefemora.

Gonopod aperture small, rounded, lateral and posterior edges strongly elevated and thickened. Gonopods as described under generic heading and shown by Figures 18 and 19.

FEMALE: Fragmented, length about 56 mm, maximum width at midbody 11.0 mm, L/W ratio near 20%. Peripheral characters very similar to those of male, but dorsum somewhat more convex and tubercles distinctly larger

Betarhacus, new genus

TYPE SPECIES: *Platyrrhacus fallens* Chamberlin, 1920.

NAME: A neologism composed of the elements *beta* (the Greek letter "b") + the combining suffix *-rhacus*, in reference to the unusually large distal process **b** of the gonotelopodite.

DIAGNOSIS: A disjunct psaphodesmine taxon with gonopod formula (**a**+ **B**) **D**, **E**, process **B** nearly twice as long as **a**, attenuated, curved ventromesad; processes **D** and **E** syntopic, **D** straight and spiniform, **E** slightly sinuous, directed proximad.

REMARKS: The affinities of this species may be sought in the sympatric genus *Parazodesmus*, represented by several species in the Solomon Islands (Hoffman, 1997), two of which (*schistogon* and *gonethus* Chamberlin) are generally similar in gonopod form to other species in New Britain. The third (*verrucosus* Pocock) is somewhat more like *B. fallens* in having a distinctly shorter telopodite, with the distal processes arising near the primary curvature. Although annectent species may be discovered in the Solomons, I believe that *Betarhacus* may be justified by the combined traits of: process **c** entirely suppressed; processes **D** and **E** syntopic at their base instead of widely separated as typical of *Parazodesmus;* and absence of long penicillate coxal setae. I provide (Fig. 22) a drawing of gonopod structure in *verrucosus* for comparison with that of *fallens* to show these differences.

The general impression is that the gonopod of *fallens* is a notably condensed derivation of the typical *Parazodesmus* version, perhaps the result of divergence at the eastern periphery of the range of that genus.

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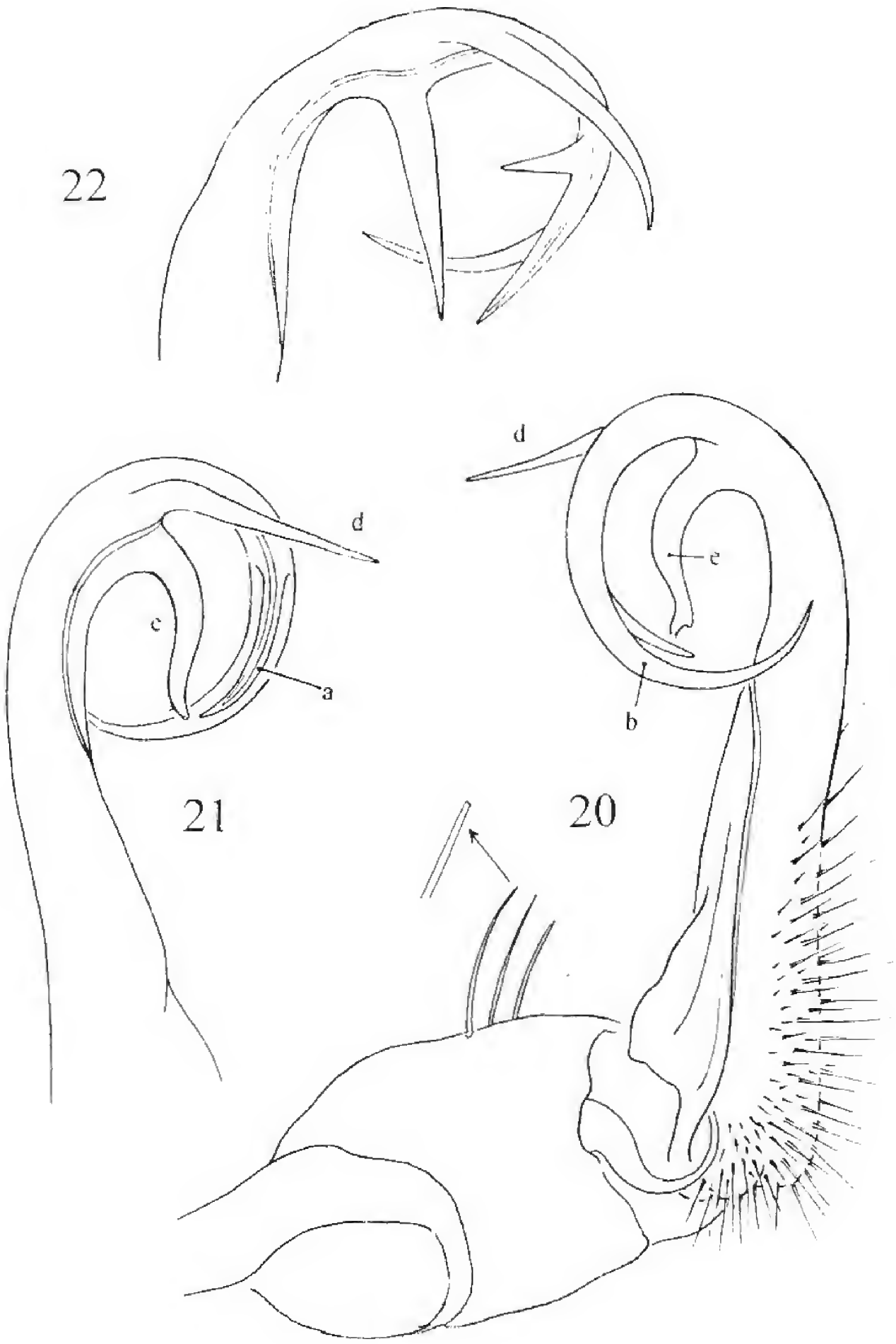

Figs. 20-21. *Betarhacus fallens* (Chamberlin). Fig. 20. Left gonopod. mesal aspect. Fig. 21. Telopodite of left gonopopd. dorsolateral aspect. Fig. 22. *Parazodesmus verrucosus* (Pocock). telopodite of left gonopod. dorsolateral aspect. to compare with Fig. 21.

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In 1967 I examined the holotype of *fallens* and prepared two drawings of the gonopod structure, but time did not permit making a fuller description of body form.

Betarhacus fallens (Chamberlin), new combination
Figures 20-21

Platyrrhacus fallens Chamberlin, 1920, Bull. Mus. Comp. Zool., 54: 142. Male holotype (MCZ 4985) from Fulakora, Solomon Islands.

DESCRIPTION (abstracted from Chamberlin 1920): Metazonites dark brown; prozonites with brown in a spot on middorsal region, on each side and ventrally, the intervening portions yellow; borders of paranota fulvous. Surface of head strongly granulotubercular except for the smooth labrum. Metaterga with three rows of distinct, rounded, widely separated tubercles. Ozopores very large, located about one pore radius from lateral paranotal edge, latter typically with three dentations between the corners, occasionally as many as four or five.

Gonopod (from personal examination) as shown in Figures 20 and 21. Coxae with only a few short, apically truncate setae on dorsal surface. Telopodite relatively short beyond trhe primary curvature, at which level processes **D** and **E** originate, continued as an evenly attenuated arc (**b**) directed ventromesad across mesal side of telopodite. Process **a** much smaller, largely concealed behind **b** in mesal aspect and entirely so in dorsal aspect. No trace of process **c**.

ACKNOWLEDGEMENTS

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